



INFECTION PREVENTION IN LONG TERM CARE

Tuberculosis

Massachusetts Department of Public Health

DISEASE OVERVIEW

Tuberculosis (TB) is caused by bacteria (tubercle bacilli) that make up the *Mycobacterium tuberculosis* complex. Other mycobacteria occasionally produce disease clinically indistinguishable from tuberculosis. *M. tuberculosis* causes virtually all TB in the United States.

Tuberculosis exists on a continuum between latent infection and active disease.

Latent TB Infection	TB infection involves a small number of TB bacteria living in the body in a latent, or “dormant”, state without causing illness. The term for this is latent TB infection or LTBI. As long as the immune system remains vigorous, TB stays dormant, walled up in small structures created by the immune system (granulomas). The only manifestation of latent TB infection is a positive tuberculin skin test reaction or interferon gamma release assay (IGRA); the chest radiograph is normal or shows these granulomas. Persons with latent TB infection do not feel sick and have no symptoms. They are not infectious and therefore cannot spread the infection to others. However, individuals with latent TB infection remain at risk of developing active TB disease throughout their lifetime, if immune containment breaks down. In the United States, 80% of active TB cases are a result of untreated latent TB infection.
TB Disease	Active TB is an infectious disease that occurs when these latent TB organisms defeat the immune containment process and begin to multiply in a person. TB can affect any part of the body, but usually affects the lungs (where it is called pulmonary TB). Systemic symptoms of TB disease include fever, fatigue, weight loss, and night sweats. Signs and symptoms specific to pulmonary TB include cough (often progressing from nonproductive to productive); in advanced stages, blood-tinged sputum (hemoptysis); and an abnormal chest radiograph, progressing from infiltrates to open cavities as the disease progresses untreated. Symptoms of extra-pulmonary TB (TB outside the lungs) are related to the specific organ or tissue involved. However, symptoms need not be present, or the patient may deny or fail to recognize symptoms and still be ill with TB. Demonstration of acid-fast bacilli (AFB) in stained smears from sputum or other bodily fluids or tissues makes a presumptive diagnosis of TB and warrants initiation of treatment. Definitive diagnosis is based on positive cultures for <i>M. tuberculosis</i> complex organisms.

Modes of Transmission

Tuberculosis is transmitted person-to-person through the air by droplet nuclei (small particles 1–5 micrometers in size), generated by persons with infectious TB. Droplet nuclei are produced when persons with pulmonary or laryngeal TB cough, sneeze, speak, or sing. Droplet nuclei may also be produced by procedures, such as sputum induction, bronchoscopy, suctioning, or vigorous wound irrigation that produce aerosols. Except for rare circumstances, persons with TB disease outside the lungs (extrapulmonary) are not infectious. Infection occurs when persons have prolonged or repeated close exposure to an infectious person, with shared air space, and they inhale the organisms.

INFECTION CONTROL AND PREVENTION

I. Employees:

Health care employee screening for latent tuberculosis infection (LTBI or latent TB infection), follow-up medical evaluations, and chest X-rays are performed according to federal Occupational Safety and Health Administration (OSHA) regulations. For further information, consult <https://www.osha.gov/SLTC/tuberculosis/index.html> and Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005 *MMWR* 2005; 54, No. RR-17, 1-141 at <https://www.cdc.gov/mmwr/PDF/rr/rr5417.pdf>.

Data on tuberculosis cases in Massachusetts are posted on the Massachusetts Department of Public Health (MDPH) website at <http://www.mass.gov/eohhs/gov/departments/dph/programs/id/tb/public-health-cdc-tb-statistics.html>. For assistance in determining the risk level for your facility, contact the MDPH Tuberculosis Program at 617-983-6970.

II. Residents:

Rationale: Many older persons were infected with *Mycobacterium tuberculosis* (TB) earlier in life, either in the United States when TB was more prevalent or in their country of origin. This population constitutes a large repository of latent TB infection.

In long term care (LTC) facilities, where residents spend prolonged periods sharing the same air, the potential for TB transmission is high. Facilities need to establish **baseline** presence of latent TB infection in new residents by means of the tuberculin skin test (TST) or a gamma-interferon release assay (IGRA, e.g., T-Spot.TB [Oxford Immunotech] or QuantiFERON TB Gold in-tube [Qiagen]). Subsequent TB testing of residents is only necessary as a response to known or suspected exposure to active TB, and should be performed using the same test that was used to establish baseline status.

Assessment and TB Testing of New Residents:

1. **Assess new residents for signs and symptoms of TB**, such as a cough of three or more weeks' duration, unexplained weight loss, or unexplained fever. If signs or symptoms are present, promptly refer for a medical evaluation and chest X-ray.
2. **Routine baseline chest X-rays on admission are not required or recommended.**
3. **Test all new residents as soon as possible after admission, unless there is documentation of a previous positive TB test** (TST reaction of 10 mm or greater, or positive IGRA).

Note on residents with previous positive TB test: Persons with a documented previous positive TST or IGRA should not undergo repeat testing unless that test result is in question. A positive test should have been followed by a clinical evaluation for active TB that included a chest radiograph. Results of that evaluation should be acquired by the facility and be in the patient's record.

If documentation of this evaluation cannot be obtained, a clinical evaluation with a chest radiograph should be performed. In the absence of symptoms, this can be delayed up to one week following admission.

Notes on testing by TST:

- The standard test method for the TST (Mantoux test) is intradermal administration of 5 tuberculin units of purified protein derivative (PPD).
 - If an initial TST result is negative, a two-step TST procedure may be required to "boost" a potential reaction that has waned over time in order to establish a reliable baseline. If a recent (within the past year) negative TST result is documented, a single-step test is acceptable. (see <http://www.mass.gov/eohhs/gov/departments/dph/programs/id/tb/testing-screening/public-health-cdc-tb-2-step-skin-testing.html>)
 - The TST is administered and read by a trained person and recorded in mm of induration (actual swelling, not redness alone) in the resident's medical chart. Absence of induration is recorded as 0 mm.
 - If the initial TST is positive and the patient does not accept the result, an IGRA may be considered. However, for the medical record, the person should be considered TB infected and evaluated with chest X-ray and examination regardless of the IGRA result.
4. **Evaluate residents with positive TB test results.** All residents with reactions of 10 mm or greater, using the two-step method where applicable, or a new positive IGRA, must have a chest X-ray and medical evaluation. (See *Medical Evaluation and Chest X-ray after positive TB test* section below.)

5. **Document and prominently display the resident's latent TB infection status** in the medical record. Latent TB infection is reportable to MDPH, per regulation. Case reporting forms are available at www.mass.gov/dph/cdc/tb
6. **All residents with latent TB infection should be considered and evaluated for treatment to prevent active disease.** Information on treatment of latent TB infection may be found at <https://www.cdc.gov/tb/publications/ltbi/treatment.htm>

Repeat TST or IGRA testing after an initial negative test only in the following circumstances:

1. An exposure to an active case of tuberculosis.
2. As a diagnostic aid when a resident is suspected of having active TB.
3. When the long term care facility has evidence of ongoing TB transmission within the facility.
4. Prior to a resident's initiating treatment with tumor necrosis factor-alpha (TNF- α) antagonists or other biologics that cause immunosuppression. In such cases, additional testing with multiple test platforms may be needed to help exclude latent TB infection.

Medical Evaluation and Chest X-ray after positive TB test:

1. Any asymptomatic resident with a new positive TST or IGRA must have a medical evaluation and chest X-ray within one week.
2. For a resident with symptoms of pulmonary TB, and an abnormal chest X-ray consistent with TB disease, evaluation should be done as soon as possible with the patient in airborne infection isolation. This usually will require hospital admission. The medical evaluation should include three (3) sputum specimens for acid fast smear and culture, collected at least 8 hours apart, with at least one collected in early morning. At least one specimen should be sent for nucleic acid amplification (NAA) testing.
3. Screen residents with active tuberculosis disease, or latent TB infection, for HIV infection. Medical management of TB disease, or latent TB infection, may be altered in the presence of HIV infection.
4. Once active TB disease is ruled out, consider the resident for treatment of latent TB infection according to current guidelines from the American Thoracic Society (ATS) and Centers for Disease Control and Prevention (CDC).
5. **Periodic chest X-rays of persons with a history of positive TST or IGRA are not advised, and are not necessary unless the individual develops signs and symptoms of tuberculosis disease.**

6. Follow-up of residents with new positive TST/IGRA after repeat testing:

All residents with a new positive TST or IGRA need a medical evaluation, a chest X-ray, and consideration for treatment of their latent TB infection. Residents who convert their skin test (defined as ≥ 10 mm induration increase within a two year period) or have a new positive IGRA following contact to an active case are at highest risk of developing active tuberculosis and should be offered treatment for latent TB infection, unless medically contraindicated.

Admission of residents with suspected or confirmed tuberculosis pulmonary tuberculosis into a LTC facility with no ability to provide airborne infection isolation (All)

1. Residents with **suspected** pulmonary or upper respiratory tract TB, as evidenced by clinical evaluation and an abnormal chest radiograph consistent with TB, can be admitted to the LTC facility, if not infectious. Criteria used to determine non-infectiousness can be similar to those used to release a hospitalized TB suspect from All. These include either:
 - Three (3) AFB smear-negative sputum specimens collected at least 8 hours apart, with at least one collected in early morning, and low clinical suspicion for infectious TB, or
 - Two (2) GeneXpert MTb-Rif[®] negative sputum specimens collected at least 8 hours apart, with at least one collected in early morning, and low clinical suspicion for infectious TB. (*For the consensus statement on the use of Cepheid Xpert MTB/RIF[®] assay in making decisions to discontinue airborne infection isolation in healthcare settings; 2016. See http://www.tbcontrollers.org/docs/resources/NTCA_APHL_GeneXpert_Consensus_Statement_Final.pdf*)
2. Residents with a **confirmed diagnosis** of pulmonary or upper respiratory tract TB who are receiving multi-drug anti-tuberculosis therapy can be admitted, if not infectious. Criteria that may be used to determine non-infectiousness in this instance include:
 - Clinical and radiographic improvement on an appropriate multi-drug treatment regimen,
 - Declining numbers of acid fast bacteria (AFB) reported in quantitative sputum smears from serial specimens obtained following treatment initiation, if initially AFB-smear-positive, and
 - Receiving an appropriate treatment regimen for at least two weeks.
3. Residents diagnosed with extra-pulmonary tuberculosis with no lung or airway involvement are not infectious and can be admitted.

Treatment Monitoring:

1. Licensed staff, trained to monitor for signs and symptoms of drug toxicity, should administer treatment for active TB disease or latent TB infection. Doses of TB medications should be witnessed and documented. Patients should be questioned about adverse effects of medications prior to each dose and, if signs or symptoms of drug toxicity are noted, or if TB symptoms are worsening, the next dose should be held until cleared by the prescribing clinician.
2. For individuals with diagnosed pulmonary TB, monthly sputum specimens should be collected until at least two sequential, monthly specimens are culture negative, in order to ensure treatment effectiveness and culture conversion.
3. Clinical and/or laboratory monitoring for toxicity should be performed by a trained provider at least monthly as recommended by American Thoracic Society/Centers for Disease Control/Infectious Disease Society of America guidelines for treatment of drug-susceptible tuberculosis (<https://academic.oup.com/cid/article/63/7/e147/2196792/Official-American-Thoracic-Society-Centers-for#82765795>).

REPORTING RESPONSIBILITIES

Massachusetts Department of Public Health officials rely on local boards of health, healthcare providers, laboratories and other public health personnel to report the occurrence of notifiable diseases as required by law (Massachusetts General Laws, Chapter 111, sections 3, 6, 7, 109, 110, 111 and 112 and Chapter 111D, Section 6. These laws are implemented by regulation under Chapter 105, Code of Massachusetts Regulations (CMR), Section 300.000: Reportable Diseases, Surveillance, and Isolation & Quarantine Requirements.)

Tuberculosis is a notifiable disease. The reporting regulation includes active or suspected active TB (pulmonary and extra-pulmonary), and latent TB infection.

For additional information, see

<http://www.mass.gov/eohhs/gov/departments/dph/programs/id/epidemiology/rdiq/reporting-diseases-and-surveillance-information.html>

MDPH reporting forms for TB are available on-line at

<http://www.mass.gov/eohhs/gov/departments/dph/programs/id/tb/instructions-for-reporting-tuberculosis-tb-in-mass.html>

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National Tuberculosis Controllers Association and Association of Public Health Laboratories. *Consensus Statement on the Use of Cepheid Xpert MTB/RIF Assay in Making Decisions to Discontinue Airborne Infection Isolation in Healthcare Settings*. On-line at <http://www.tbcontrollers.org/resources/airborne-infection-isolation/#.WV0WGxUrKM8>